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ABSTRACT

This paper summarizes one teacher educator's experiences using videotaped episodes from her own high school teaching days to generate discussion about the teaching and learning of mathematics. The paper argues for increased use in teacher education of videotaped episodes that focus on the students rather than the teacher. It also explores the value of having the teacher whose classroom is featured on the tapes present for the discussion of the episodes. Data for the paper are drawn from the teacher educator's experiences with preservice teachers in mathematics methods classes at the University of British Columbia. Data also come from the teacher educator's experiences in workshops with practicing teachers from surrounding school districts. The data suggest that video extracts have the power to draw viewers close to the complexities of teaching and learning in classrooms while releasing them from the concern of having to attend to all that is happening in the classroom. (Contains 25 references.) (SM)

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Close Encounters of the Complex Kind: Using Videotape in Teacher Education

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In my work as a teacher educator I have frequently used videotaped episodes of my own high-school teaching to generate discussion about the teaching and learning of mathematics. This paper summarises my experiences, and develops an argument for the increased use, in both pre-service teacher education and in-service teacher professional development, of videotaped episodes which focus on the students rather than on the teacher. The paper also explores the value of having the teacher whose classroom is featured on the tapes present for the discussion of the episodes. The data on which this paper is based are drawn from my experiences with pre-service teachers in mathematics methods classes that form part of the regular one-year secondary and elementary teacher preparation programmes at the University of British Columbia, as well as from my experiences in workshops with practising teachers from surrounding school districts.

Videotape in research and teaching

Numerous educational research studies testify to the use of video-recording as a major means of classroom data collection (see, for example, Pirie & Kieren, 1994; Wood, Cobb & Yackel, 1991), and there is a significant body of literature dealing specifically with the ways in which video can be employed as a data collection and analysis tool (see, for example, Artzt & Armour-Thomas, 1992; Bottorff, 1994; Calderhead, 1981; Goldman-Segall, 1993; Marland, 1984). Some attention has also been paid to the use of videotaped episodes of classroom practice in the education and professional development of future and practising teachers. For example, Selinger (1994, p. 248) has found that the use of video can "possibly enhance student understanding of teaching". However, as Ball (1995) notes we know little about what people attend to and learn when watching videotape. Ball suggests, therefore, that what can be learned from videotape is worth investigating, and asks how the experience of viewing should be structured to generate learning. This paper describes specific ways in which pre-service teachers' understanding of teaching may be enhanced, and explores the potential offered by video material to foster the belief that teaching is a learning activity, to raise awareness of the importance of reflective practice, and to focus attention (if used carefully) on the student rather than the teacher. Ball (1988) also suggests that we examine the influences of different kinds of teacher education experiences on teacher candidates' knowledge about and orientations towards mathematics teaching and learning. This paper is intended to contribute to that process.

In an informal publication directed to teachers, Jaworski (1989) also promotes the use of videotape for professional development. Her publication proposes ways in which teachers can initiate and sustain discussion about video recordings taken from their own classrooms, or professionally produced recordings such as those available through the Open University in the United Kingdom. The collaborative approach she advocates is extremely valuable. Although I cannot always be with the pre-service teachers I teach as

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they struggle with issues of teaching and learning when they are in their separate classroom situations, I can bring a part of a classroom to them in the form of a videotape, so that we can explore the issues together. Whilst I do not claim that video experiences are a substitute for teaching practice for pre-service teachers, or a substitute for experience in real-life classroom situations for practising teachers, I do claim that there are some advantages to the use of videotaped episodes over other forms of representation of classroom activities, such as a text-based case-study, for example.

'Cases' - narratives and descriptions of teaching that were constructed specifically for use in teacher education (Sykes & Bird, 1992) are sometimes criticised because students' encounters with the teaching within case materials is indirect. Such criticisms might also be directed to my use of videotaped extracts in teacher education, but, like Sykes and Bird (1992), I contend that though the students' encounters with the teaching and learning within my materials may be indirect, they are not passive. Pimm (1993) describes two common responses from adults (both teachers and teacher educators) as a result of being shown a piece of classroom videotape, which he has labelled *televisual* (which is pertinent here) and *intimidated* (to which I will return later). A televisual response is one that is based on the expectations that people have when a TV monitor is introduced into the room. Pimm suggests that on these occasions students tend to become passive - they have been conditioned by their usual experiences of television viewing to expect to be entertained, not stimulated intellectually. Pimm suggests that both of these responses (*intimidated* and *televisual*), whilst understandable and explicable, detract from the value of using videotape. I claim that the impact of each is reduced when the teacher whose classroom is featured on the video is present for the ensuing discussions.

I have found that offering pre-service teachers video excerpts that feature my own high-school classroom (recorded at a time when I was a full-time teacher of mathematics) promote viewing that is far from passive. The pre-service teachers recognise that they are being offered the relatively unusual opportunity of investigating an episode of teaching practice *with* the teacher who is featured on the video, and they respond enthusiastically and with interest. My students are aware of the fact that when the video is over they will have the opportunity to press me for more information than the video itself could provide. They watch and listen intently and certainly take the opportunity when it is offered to critique aspects of what they are viewing, to probe for additional very specific information, and to explore tangential issues that they feel are relevant or interesting. Without exception I have found the students with whom I have shared these experiences to be curious, engaged and reflective, and the discussions that have ensued have been spirited and intense. In many cases the beginning teachers have expressed ideas about teaching and learning which have revealed to me their current theoretical bases, and have enabled me to suggest alternative ways of viewing the activities on the tapes. I learn a lot about my students in these explorations, just as they learn a lot about me. In fact, the discussions tend to resemble Gadamer's (1975) conversations, which he notes are distinct from other forms of communication such as debates and discussions in that their topic of focus is not predetermined, rather it arises in the process of conversing. I will say more about these conversations later.

Lampert and Ball (1990), who also use videotapes of their own elementary classrooms in teacher education, have extended their use of such video extracts by employing hypermedia technology to create an environment which they say brings teacher education students "close" to the teaching they are studying. Their students' engagement with the teaching and learning represented by such resources may still be indirect but it is also far from passive, as the beginning teachers actively reflect on and research the teaching and learning of mathematics. Like myself, Lampert and Ball also exploit the value of having the teacher who is featured on the videotapes present for the analysis of those tapes by the pre-service teachers. In this way, through the ability to interrogate and probe the "source", pre-service teachers can digress into other areas that written text, or video, alone cannot support. For example, on one particular day, after viewing an episode where I was observed to work exclusively for about ten minutes with just two children, and after discussing the children's learning and my teaching for some time, one pre-service teacher asked how I was able to maintain this level of concentration on just two students without (as it appeared to him) monitoring the rest of the room. Though I had not intended this issue to be the focus of our conversation that afternoon we explored ideas and digressed for a time into other concerns about the management of non-traditional classroom structures. Such tended to be the tone and flavour of all our conversations when videotapes were introduced.

Video tapes, then, offer a rich environment for exploration, and open avenues which might be unanticipated. I encourage pre-service teachers to ask questions about what they are seeing and hearing on the videotapes, whether pertinent to the specific issue we are discussing or (seemingly) tangential. Such questions open up our conversations and enable me to encourage broader thinking about what it means to teach. For example, one day I presented two episodes both recorded in my high-school classroom and both featuring me working with the same pair of children. On one of the tapes the background noise from the remaining children in the room was, to say the least, loud, and on the other tape there was almost none. After some time one of the pre-service teachers stopped the discussion to enquire about the tapes. She had assumed that the tape with no background noise had been recorded in an interview format[1] and had been surprised to learn that there were indeed twenty-eight other children in the room out of view of the camera. Her observation gave us an opportunity talk about why the same class of children might respond so differently to the same kind of task on different days, and thereby to probe peripheral but important issues such as the inherent unpredictability of classroom life.

Re-focusing attention on learning

It is also claimed that case teaching (of which the use of videotaped extracts might be considered a part) draws students into the situations, problems, and roles portrayed, and that engaging with cases can therefore, in one sense, become like role-playing (Sykes & Bird, 1992). Placing students in a hypothetical role-playing situation creates a "safe" environment for practice, but continues to privilege the role of the teacher over the

[1] Though most of the video episodes I use are classroom based, some feature the children in semi-structured interviews with me.

perspectives of the students. In my use of videotaped episodes I de-emphasise this role-playing attitude by orienting the pre-service teachers to a focus on the students who are the focus of the videos. Through there is an eventual and inevitable progression to a consideration of the role of the teacher it is not immediate, and it is not my main aim. Instead, beginning teachers are challenged to turn their attention outwards instead of inwards. I use the word challenge here in recognition of the fact that research has shown that, for a variety of reasons, beginning teachers tend to privilege their own perspective (as teacher) over the perspectives of the students they are to teach (Ball, 1988; Merseth, 1993; Wilson, 1990).

In addition to being shown video extracts of other teachers, pre-service teachers are sometimes videotaped as part of their teacher preparation programmes, and asked to view the tapes and report back on the experience (see, for example, Struyk & McCoy, 1993). They may even be given specific faults to "watch out for", such as poor questioning techniques (including inappropriate wait-time and question distribution). Though such recordings are undoubtedly of use to beginning teachers, they focus the pre-service teachers' attention closely on themselves rather than on whether, how, and what their students are learning. Ball (1988) clearly articulates the importance of re-focusing beginning teachers' attention on the learners. I also claim that pre-service teachers' attention needs to be drawn away from, rather than towards, themselves, and argue that video extracts (which need not be drawn from recordings of the pre-service teachers' own practica classrooms) that focus primarily on the students rather than on the teacher facilitate a re-focusing of attention towards the process of learning.

I am careful in the choice of video excerpts to use, particularly in pre-service education and thus far I have used only excerpts from my own high-school classroom. The video tapes focus closely on a pair of students in each of the classes I videotaped. As I had no research assistant to assist me with the taping of my classes, the camera was placed at the front of the room at the beginning of the lesson, it was focused on the students to be taped, it was switched on, and, generally speaking, it was not touched again until the end of the lesson. As such the resulting videotapes feature just the pair of students on whom the camera was focused. The picture never pans out to reveal the rest of the class, or the teacher (me) unless I move into the view of the camera, usually at the behest of the students featured[2]. These tapes, then, present a very particular view of the classroom. The viewer is necessarily drawn into the experience of the students featured on the tapes, for there is little else on which to focus one's eyes and ears.

Some of the excepts I choose to offer to pre-service teachers are those which feature students 'struggling' for a period of time (ranging from a matter of a few seconds to several minutes) with a particular problem before calling for help from me as their teacher. In being offered such excerpts, the beginning teachers I have taught have initially

[2] At the time I wanted to learn more about how my students came to *understand* the mathematics they were studying, which is why I chose to focus on the conversations and actions of pairs of students rather than capture a wider (but more general) view of the classroom.

focused on student challenges and successes, and only later have begun to explore the role of the teacher in the episodes. Such a re-orientation is, I claim, predominantly due to the particular focus of the camera view. That the pre-service teachers show a marked willingness to engage in explorations of student thinking in preference to (or at least before) an exploration of teacher actions is significant, and suggests that such video excerpts offer potential for supporting the re-orienting of beginning-teacher thinking. Fennema et al. (1996) note that there is increasing evidence that knowledge of children's thinking is a powerful influence on practising teachers as they consider instructional change. Such evidence suggests that knowledge of children's thinking might also be significant in breaking the chain of pre-service teachers' dependence on a teacher-focused orientation to teaching.

It has also been my experience that when the beginning teachers do turn their attention away from student learning and towards the teaching, as they inevitably will, any question or comment that might be construed as critical of the teacher (who it should be remembered is, in this case, also their university tutor) comes cautiously. At this point I make explicit my stance on this matter - that I wholeheartedly encourage their critique and value their inquisitive questions. And I tell them why - because such challenges provoke me to reflect more deeply on my beliefs about teaching and learning. In this way I hope that the first seeds are sown in the quest to foster reflection. However, beginning teachers will only be comfortable critiquing the classroom practice of their university tutor if they can be assured that such critique will be welcomed in the spirit in which it is offered. I tend to introduce video extracts only after I have established a good working relationship with my students, and after they have heard me (more than once) reflect openly on problematic areas of my own practice.

Problematising teaching and learning is an important part of my aim of supporting thoughtful teachers who listen to their students and think about their own practice. In choosing to present excerpts of teaching which I think are problematic in preference to excerpts that I believe would constitute 'exemplary' practice I am distancing myself from those who believe that beginning teachers should (only) be shown episodes of 'best practice', or at least 'good practice', and encouraged to emulate such teaching in their own classrooms (see, for example, Pollak & Breault, 1987). As Pimm (1993) notes, beginning teachers are often intimidated by carefully selected extracts featuring experienced teachers and apparently highly motivated and responsive pupils. Pimm reports that this intimidation leads to defensiveness and that beginning (and more experienced) teachers often respond by criticising the teaching. In my work with practising and pre-service teachers I have attempted to establish a difference between critique and criticism, elaborating on critique as an exploratory inquiry into practice, and criticism as a potentially destructive and ultimately unrewarding pursuit for individuals interested in professional development. As Ball (1995) notes the challenge is one of developing a stance that is less simply evaluative and more analytic of practice. I acknowledge that there is value in also offering pre-service (and practising) teachers opportunities to experience, through videotape or some other means, practice which is 'exemplary', for, as Ball (1990) notes, unless pre-service teachers have experience of an

alternative model of teaching to the traditional one which many of those of us who enter the teaching profession have experienced in our own schooling, then they cannot hope to be able to enact a different conception of what it means to teach when they are faced with the prospect of beginning to teach in their own classrooms. However, I do not believe that pre-service (or practising) teachers necessarily need to experience how such an alternative conception can be enacted *in a school setting*. Teacher educators must reflect firstly on their own practice in their teacher education courses, and recognise that they can and should model the practices they are championing there, too. In this way, students can experience first hand what it means to learn differently, and therefore learn to appreciate the possibilities opened by learning to teach differently.

Coping with complexity

My work has shown that video extracts have the power to draw viewers close to the complexities of teaching and learning in classrooms, whilst releasing the viewer from the concern of having to attend to all that is happening in the classroom. Structured practicum experiences which allow beginning teachers to work with part of a class initially rather than the whole class, or which allow for co-teaching in a beginning teacher's early experiences, offer similar opportunities for release from the concerns of managing a class of learners, and are certainly valuable, however, such experiences are not always supported by the extended explorations that are possible with the use of videotaped episodes, and are not usually common experiences for all of the group. In offering pre-service teachers the experience of exploring *my* teaching, I am offering a common experience which can be returned to throughout the course. My experience is that videotaped episodes have the tendency to make a significant impact on subsequent course discussions, and I have noted the pre-service teachers (and myself) repeatedly referring to incidents from the videos whilst making connections to the theory and practice of teaching and learning. In fact, several pre-service teachers have noted, in written and verbal communications with me, that they valued highly these opportunities to explore my teaching. Many welcomed the opportunity to catch glimpses of their university instructor teaching in a high-school context, and several commented favourably on my willingness to 'bare my soul', and especially to expose some of (what I considered to be) my less-than-excellent teaching episodes to their scrutiny. Far from undermining my authority as an educator, this exposure actually strengthened the students trust in my (university-based) perspective, and provided a link between their university-based courses and their school experiences[3]. In addition, from my perspective such practices model the art of reflecting on teaching, and emphasise the importance of continuing to perceive oneself as a learner, throughout one's teaching career.

Though the complexities of managing a class of learners whilst attending to the learning of a small group or a single student are alleviated by the use of video recordings, much of the complexity of the classroom situation is preserved. Even a short excerpt of six or seven minutes has, in my university classroom, absorbed several hours of class time. Carefully chosen episodes can spark arguments, disagreements, conjecturing,

[3] I am not suggesting that this is the only such link that occurred in their preparation programme, rather I am emphasising the students' interpretation of the experience as they related it to me.

explorations and conversations that last for days. Once, whilst waiting in a queue in the university snack bar, I was challenged by a group of pre-service teachers who pressed me for further details about my teaching interventions on a video we had studied two days before. They had been arguing about why I had made a particular intervention, and were too excited about the disagreement to wait the few hours until our next class, scheduled for later that day. The excitement that is provoked by the complexity of video is a joy for me, as I am always surprised by what pre-service and practising teachers see and hear in the extracts and by how differently certain actions and statements presented on the videos are perceived by different groups or individuals. The complexity also presents problems for me as a teacher educator, though, as I struggle to make choices about how to structure the video-based classes, how to assess what and whether the pre-service teachers are learning, whether to re-direct the conversation, when to move on to a new extract or to another activity altogether, and whether to share these anxieties with the class. As this list of my struggles seems to closely resemble a list which might be drawn up to represent the struggles that many pre-service teachers go through in learning to teach, I am able to make explicit to the pre-service teachers what it is that I think *I* am learning from our interactions, thereby reinforcing my positioning as a learner as well as a teacher. In celebrating the complexities of these techniques, though, I do not want to overlook the simplicities. The most simple of questions can also provide wonderful opportunities for learning. For example, one of my favourite video episodes is one which features a pair of students trying to find the perimeter of the shape shown in Figure 1.

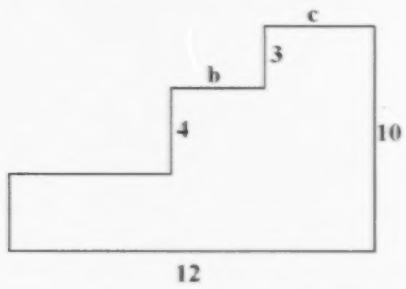

Figure 1

The two students work for a time, then call for help from me, and eventually produce the following expression for the perimeter[4]: $41 - (1c + 1b) + 3 + 1b + 1c$. Asking the question: Is their answer correct? tends to provoke some discussion amongst both pre-service and practising teachers. Asking: Is their answer correct enough? usually provokes a heated exchange. The matter is compounded by the fact that I am observed to accept the students' answer as correct without working with them to simplify it. This causes concern for both pre-service and practising teachers, and has provided a springboard into considerations of such diverse questions as 'What is mathematics, and who gets to create and control it?', 'What does it mean to do mathematics?', and 'What is the role of the teacher in occasioning students' understanding?'

[4] I detail elsewhere how this answer was obtained (Towers, 1996b).

Advantages and disadvantages of using videotape

There are, of course, as with any technique, disadvantages with using videotaped episodes in teacher education, even when the teacher featured on the videotape is present for the ensuing discussions. One, which I mentioned earlier, is that some students will be reluctant to offer critique lest it be looked upon unfavourably by their tutor at assessment time. I believe that this reluctance can be dissipated with thoughtful explication of one's stance on reflective teaching, and through an explicit modelling of the critique of one's own teaching. A second feature of videotape use which can be perceived by some as a disadvantage is the time it involves. I have found that the discussions that are generated by my videotape offerings always absorb a large portion of class time. I am happy for this to happen, though, if the discussions are fruitful and the class remains engaged, and rather than viewing the absorption of time as problematic I enthusiastically allow myself to be drawn into the conversation, recognising that it reflects the pre-service teachers' growing interest in student thinking and their reduced "need" for specific information about how to teach mathematics.

I am less concerned that, as a class, we may not have time to cover the ways in which a specific topic area might be taught due, say, to the time we have spent discussing one child's understanding of the concept of perimeter, if I think that the pre-service teachers are learning to respect the diversity of children's thinking about mathematics, learning to listen to what children say about mathematics, not just to what we want or expect them to say (Davis, 1996), and learning to be excited about the possibilities for teaching differently. If the pre-service teachers are becoming more communicative and curious about children's learning and the teacher's role in supporting that learning, am I not fulfilling at least one of my roles as a teacher educator? As Davis and Sumara (1997, p. 108) note, many teacher education programmes attempt to "introduce prospective teachers to every aspect of the many-faceted role of the teacher - all in the absence of any deep understanding of the students who are expected to be taught and to learn". They suggest that the boundaries that currently define schools and universities be blurred so that the relations between that which we call "teaching" and that which we call "learning" be better understood as "mutually specifying, co-emergent, pervasive, and evolving practices" (p. 123). Bringing part of my own high school classroom into the university setting to share with pre-service teachers is one way in which I seek to respond to this call, whilst simultaneously interrupting pre-service teachers' conceptions of what it means to teach mathematics, what it means to learn mathematics, and, for that matter, what mathematics is[5].

Despite the limitations I have noted there are many advantages of using videotape (especially of one's own school teaching) in teacher education. As I have mentioned, the ability to re-orient pre-service teachers' attention to the learner (with carefully chosen excerpts) is important. Also of importance is the influence that engaging in critique of teaching *with* the teacher appears to have on pre-service teachers' understanding of teaching. In addition, such videotape episodes can be used to launch other inquiries. For

[5] See Davis (1996) for an elaboration of this perspective.

example, as a final assignment for my class I encourage the pre-service teachers to choose one or more mathematical problems and to converse with another adult, or with a child of their acquaintance, about those problems (usually merely by asking the person to try to solve the problems). The pre-service teachers are required to video- or audio-tape that conversation, and to write about what they learn about the person's understanding of the mathematics that is generated. Though I have many reasons for asking the pre-service teachers to do this, not all pertinent to the focus of this paper, some of the most important are to provoke them to reflect on what constitutes a worthwhile problem (if one is seeking to learn about understanding not just about competence), to ask [redacted] to consider the nature of their own interventions, especially if their participant struggles with the problem, and to encourage reflective thinking. I encourage a variety of presentations of their findings, suggesting that they can choose to present a summary of everything that happened or focus closely on one small incident. I offer examples of my own writing where I reflect on some aspect of my own teaching and my students' learning based on one of the video excerpts we have studied together, not to impose my structure onto what the pre-service teachers will produce, but to link the expansive conversations we have had in class about the video episodes to the theoretical perspectives that we have also discussed and which are highlighted in my writings[6].

Final Remarks

Though not all teacher educators have access to recordings of their own elementary or high school teaching, I strongly recommend the use of the technique I have described here wherever possible. I also hope that more teacher educators will embark upon the kinds of projects that researchers such as Lampert and Ball (1990) have initiated, whereby relationships are established with schools which allow university-based educators to teach in those schools and to record their experiences for use in teacher education programmes. My work has shown that use of videotaped materials which feature a university instructor's own classroom teaching can be a powerful intervention in teacher education. The opportunity to analyse lessons with the teacher who taught them seems to be a particularly significant event for many pre-service teachers. Through the use of video extracts which focus closely on a small group of learners, pre-service (and practising) teachers are released to consider at length the mathematical understandings of just a few students, a privilege they are not normally afforded when in a practicum (or teaching) situation, and such considerations encourage pre-service and practising teachers to be interested in how students learn, not simply in how they should be taught. Such a re-orientation is important in fostering reflective teaching, and, through such reflection, participating in the shaping of new orientations to teaching.

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[6] See Towers (1996a) and Towers (1996b) for examples of the writings I offer.

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